

What is Claimed is:

1. A hair-straightening formulation comprising:
 - i. an acceptable diluent;
 - ii. about 0.25% to about 30% by weight of at least one alkanoic acid; and
 - 5 iii. about 5% to about 40% by weight of polyethylene glycol mono stearate, wherein the polyethylene glycol mono stearate is from about 200 to 6,000 Daltons.
2. The formulation of claim 1 wherein said diluent comprises water, said formulation comprises about 0.25% to about 30% alkanoic acid by weight and greater than about 40% water by weight.
- 10 3. The formulation of claim 1 further comprising less than about 30% by weight of at least one auxillary component selected from a fragrance, odor masker, conditioner, gelling agent, and penetration enhancer.
4. The formulation of claim 1 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-

15 methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, hex-2-enoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.
5. The formulation of claim 1 wherein the polyethylene glycol mono stearate

20 is from about 200 to about 1,000 Daltons.
6. The formulation of claim 1 where the polyethylene glycol mono stearate is PEG-200, PEG-400, PEG-600, PEG-1,000, PEG-4,400 or PEG-6,000.
7. The formulation of claim 1 where the polyethylene glycol mono stearate is PEG-400.
- 25 8. A formulation according to claim 1 wherein said composition is in the form of a shampoo, liquid, gel, cream, solid, mousse, paste, aerosol, a rinse-off or leave-in conditioner, the composition is to be applied before or after dyeing, bleaching, permanent waving or hair-straightening or a formulation to be applied between two stages of hair-straightening.
- 30 9. A hair-straightening formulation comprising:

about 0.25% to about 30% by weight of at least one alkanoic acid diluted in greater than 40% water by weight;

about 5% to about 40% by weight of polyethylene glycol mono stearate where the polyethylene glycol mono stearate is from about 200 to about 5,000 Daltons;

5 and less than about 30% by weight of at least one auxillary component selected from a fragrance, odor masker, conditioner, penetration enhancer, and gelling agent.

10. The formulation of claim 9 having a pH value of less than 7.0 effective for straightening hair.

11. A formulation for hair-straightening maintenance, maintaining the style
10 and set of curly and straightened hair, softening of hair, relaxation of curl, prevention and reduction of frizziness of hair having a pH greater than about 2.4 comprising about 8% to about 30% by weight of at least one alkanoic acid; and about 5% to about 40% by weight of polyethylene glycol mono stearate, wherein the polyethylene glycol mono stearate is from about 200 to about 6,000 Daltons.

15 12. The formulation according to claim 11 having a pH of 5.5 or lower.

13. The formulation of claim 11 further comprising a diluent, the diluent comprises water, and comprising about 0.25% to about 30% alkanoic acid by weight and greater than about 40% water by weight.

14. The formulation of claim 11 further comprising less than 30% of at least
20 one auxillary component selected from a fragrance, odor masker, conditioner, gelling agent, and penetration enhancer.

15. The formulation of claim 11 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, hex-2-enoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

16. The formulation of claim 11 wherein the polyethylene glycol mono stearate is from about 200 to about 1,000 Daltons.

30 17. The formulation of claim 11 where the polyethylene glycol mono stearate is PEG-200, PEG-400, PEG-600, PEG-1,000, PEG-4,400 or PEG-6,000.

18. The formulation of claim 11 where the polyethylene glycol is PEG-400 mono stearate.

19. A formulation according to claim 11 wherein said composition is in the form of a shampoo, liquid, gel, cream, solid, mousse, paste, aerosol, a rinse-off or leave-in conditioner, the composition is to be applied before or after dyeing, bleaching, permanent waving or hair-straightening or a formulation to be applied between two stages of hair-straightening.

20. The formulation according to claim 11 wherein said alkanolic acid is acetic acid, and further comprising water, a conditioner comprising methylsulfonylmethane or dimethylsulfone, and/or a thickener comprising xanthan gum.

21. A method for straightening hair comprising:

(i) contacting said hair with a composition about 8% to about 30% by weight of at least one alkanolic acid; and about 5% to about 40% by weight of polyethylene glycol mono stearate where the polyethylene glycol mono stearate is from about 200 to about 6,000 Daltons.

(ii) optionally washing said hair with a shampoo; and

(iii) optionally conditioning said hair.

22. The method of claim 21 in which the alkanolic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, 2-hexenoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

23. A hair straightening formulation comprising an alkanolic acid and an enzyme.

24. The formulation of claim 23 wherein said alkanolic acid is about 8% to about 40% by weight.

25. The formulation of claim 23 wherein the enzyme is selected from the group consisting of amylase, protease, peptidase, lipase, proteinase, endoprotease and aminopeptidase.

26. The formulation of claim 23 wherein said enzyme is a protease and said protease has endopeptidase activity.

27. The formulation of claim 23 wherein said enzyme is a protease and said protease has aminopeptidase activities.

5 28. The formulation of claim 23 wherein said enzyme is Alcalase® 2.4L protease.

29. The formulation of claim 23 wherein said enzyme is Flavourzyme® aminopeptidase.

10 30. The formulation of claim 23 further comprising a diluent, the diluent comprises water, and comprising about 0.25% to about 30% alkanoic acid by weight and greater than about 40% water by weight.

31. The formulation of claim 23 further comprising less than 30% of at least one auxillary component selected from a fragrance, odor masker, conditioner, gelling agent, and penetration enhancer.

15 32. The formulation of claim 23 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, hex-2-enoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

20 33. A formulation according to claim 23 wherein said composition is in the form of a shampoo, liquid, gel, cream, solid, mousse, paste, aerosol, a rinse-off or leave-in conditioner, the composition is to be applied before or after dyeing, bleaching, permanent waving or hair-straightening or a formulation to be applied between two stages of hair-straightening.

34. A formulation for maintaining the style of curly or straightened hair comprising:

- i. an acceptable diluent;
- ii. about 0.25% to about 30% by weight of at least one alkanoic acid; and
- 30 iii. about 5% to about 40% by weight of polyethylene glycol mono stearate, wherein the polyethylene glycol mono stearate is from about 200 to 6,000 Daltons.

35. The formulation of claim 34 wherein said diluent comprises water, said formulation comprises about 0.25% to about 30% alkanoic acid by weight and greater than about 40% water by weight.

36. The formulation of claim 34 further comprising less than about 30% by weight of at least one auxillary component selected from a fragrance, odor masker, conditioner, gelling agent, and penetration enhancer.

37. The formulation of claim 34 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, hex-2-enoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

38. The formulation of claim 34 in which the alkanoic acid is acetic acid.

39. The formulation of claim 34 wherein the polyethylene glycol mono stearate is from about 200 to about 1,000 Daltons.

40. The formulation of claim 34 where the polyethylene glycol mono stearate is PEG-200, PEG-400, PEG-600, PEG-1,000, PEG-4,400 or PEG-6,000.

41. The formulation of claim 34 where the polyethylene glycol mono stearate is PEG-400.

42. A formulation according to claim 34 wherein said composition is in the form of a shampoo, liquid, gel, cream, solid, mousse, paste, aerosol, a rinse-off or leave-in conditioner, the composition is to be applied before or after dyeing, bleaching, permanent waving or hair-straightening.

43. A method maintaining the style of curled and straightened hair comprising:

(i) contacting said hair with a composition about 8% to about 30% by weight of at least one alkanoic acid; and about 5% to about 40% by weight of polyethylene glycol mono stearate where the polyethylene glycol mono stearate is from about 200 to about 6,000 Daltons.

(ii) optionally washing said hair with a shampoo; and

(iii) optionally conditioning said hair.

44. The method of claim 43 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, 2-hexenoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-
 5 hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

45. A hair straightening and style-maintaining formulation comprising an alkanoic acid and an enzyme.

46. The formulation of claim 45 wherein said alkanoic acid is about 8% to
 10 about 40% by weight.

47. The formulation of claim 45 wherein the enzyme is selected from the group consisting of amylase, protease, peptidase, lipase, proteinase, endoprotease and aminopeptidase.

48. The formulation of claim 45 wherein said enzyme is a protease and said
 15 protease has endopeptidase activity.

49. The formulation of claim 45 wherein said enzyme is a protease and said protease has aminopeptidase activities.

50. The formulation of claim 45 wherein said enzyme is Alcalase® 2.4L protease.

20 51. The formulation of claim 45 wherein said enzyme is Flavourzyme® aminopeptidase.

52. The formulation of claim 45 further comprising a diluent, the diluent comprises water, and comprising about 0.25% to about 30% alkanoic acid and greater than about 40% water by weight.

25 53. The formulation of claim 45 further comprising less than 30% of at least one auxillary component selected from a fragrance, odor masker, conditioner, gelling agent, and penetration enhancer.

54. The formulation of claim 45 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, hex-2-enoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-
 30 methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-

hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

55. The formulation of claim 45 in which the alkanoic acid is acetic acid.

56. A formulation according to claim 45 wherein said composition is in the
5 form of a shampoo, liquid, gel, cream, solid, mousse, paste, aerosol, a rinse-off or leave-in conditioner, the composition is to be applied before or after dyeing, bleaching, permanent waving or hair-straightening or a formulation to be applied between two stages of hair-straightening.

57. A formulation to prevent frizz of hair comprising:

- 10 i. an acceptable diluent;
ii. about 0.25% to about 30% by weight of at least one alkanoic acid; and
iii. about 5% to about 40% by weight of polyethylene glycol mono stearate,
wherein the polyethylene glycol mono stearate is from about 200 to 6,000 Daltons.

58. The formulation of claim 57 wherein said diluent comprises water, said
15 formulation comprises about 0.25% to about 30% alkanoic acid by weight and greater than about 40% water by weight.

59. The formulation of claim 57 further comprising less than about 30% by weight of at least one auxillary component selected from a fragrance, odor masker, conditioner, gelling agent, and penetration enhancer.

20 60. The formulation of claim 57 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, hex-2-enoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-
25 oxonanoic acids.

61. The formulation of claim 57 in which the alkanoic acid is acetic acid.

62. The formulation of claim 57 wherein the polyethylene glycol mono stearate is from about 200 to about 1,000 Daltons.

63. The formulation of claim 57 where the polyethylene glycol mono stearate
30 is PEG-200, PEG-400, PEG-600, PEG-1,000, PEG-4,400 or PEG-6,000.

64. The formulation of claim 57 where the polyethylene glycol mono stearate is PEG-400.

65. A formulation according to claim 57 wherein said composition is in the form of a shampoo, liquid, gel, cream, solid, mousse, paste, aerosol, a rinse-off or leave-in conditioner, the composition is to be applied before or after dyeing, bleaching, permanent waving or hair-straightening.

66. A method for preventing frizz of hair comprising:

(i) contacting said hair with a composition about 8% to about 30% by weight of at least one alkanolic acid; and about 5% to about 40% by weight of polyethylene glycol mono stearate where the polyethylene glycol mono stearate is from about 200 to about 6,000 Daltons.

(ii) optionally washing said hair with a shampoo; and

(iii) optionally conditioning said hair.

67. The method of claim 66 in which the alkanolic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, 2-hexenoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

68. A hair straightening and style-maintaining formulation comprising an alkanolic acid and an enzyme.

69. The formulation of claim 68 wherein said alkanolic acid is about 8% to about 40% by weight.

70. The formulation of claim 68 wherein the enzyme is selected from the group consisting of amylase, protease, peptidase, lipase, proteinase, endoprotease and aminopeptidase.

71. The formulation of claim 68 wherein said enzyme is a protease and said protease has endopeptidase activity.

72. The formulation of claim 68 wherein said enzyme is a protease and said protease has aminopeptidase activities.

73. The formulation of claim 68 wherein said enzyme is Alcalase® 2.4L protease.

74. The formulation of claim 68 wherein said enzyme is Flavourzyme® aminopeptidase.

5 75. The formulation of claim 68 further comprising a diluent, the diluent comprises water, and comprising about 0.25% to about 30% alkanoic acid by weight and greater than about 40% water by weight.

76. The formulation of claim 68 further comprising less than about 30% by weight of at least one auxillary component selected from a fragrance, odor masker,
10 conditioner, gelling agent, and penetration enhancer.

77. The formulation of claim 68 in which the alkanoic acid is selected from the group consisting of acetic, methanoic, ethanoic, 2-methylbutanoic, propanoic, 2-methylpropanoic, 2,2 dimethylpropanoic, decanoic, octanoic, hex-2-enoic, heptanoic, 6-methylheptanoic, 3-ethylpentanoic, 3-chloropentanoic, 2-hydroxypropanoic, 2-chloro-4-
15 hydroxyhexanoic, hexanedioic, octadecanoic, 4-oxopentanoic, and 6-hydroxy-4-oxonanoic acids.

78. The formulation of claim 77 in which the alkanoic acid is acetic acid.

79 The formulation according to claim 68 wherein said composition is in the form of a shampoo, liquid, gel, cream, solid, mousse, paste, aerosol, a rinse-off or leave-
20 in conditioner, the composition is to be applied before or after dyeing, bleaching, permanent waving or hair-straightening.